

# GLENNALLEN TO PALMER SPUR LINE SOILS STUDIES

VOLUME 2 OF 2 APPENDICES

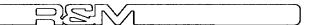
**CONTRACT NO. 06-0410** 

Prepared For:

ALASKA DEPARTMENT OF REVENUE ALASKA NATURAL GAS DEVELOPMENT AUTHORITY

411 West 4<sup>th</sup> Avenue Anchorage, Alaska 99501

October, 2005



### FINAL SUMITTAL

# GLENNALLEN TO PALMER SPUR LINE SOILS STUDIES

Volume 2 of 2 APPENDICES

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# STATE OF ALASKA DEPARTMENT OF REVENUE ALASKA NATURAL GAS DEVELOPMENT AUTHORITY

411 West 4<sup>th</sup> Avenue Anchorage, Alaska 99501

Contract No. 06-0410

Prepared by:

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R&M Project No. 1291.01

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### APPENDIX A

### **ROUTE SOIL CONDITIONS**

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## STATE OF ALASKA DEPARTMENT OF REVENUE

### ALASKA NATURAL GAS DEVELOPMENT AUTHORITY

# GLENNALLEN TO PALMER SPUR LINE SOILS STUDIES

CONTRACT NO. 06-0410

PREPARED BY:

9101 VANGUARD DRIVE ANCHORAGE, ALASKA 99507

R&M PROJECT NO. 1291.01

LIST OF DRAWINGS								
TITLE/DESCRIPTION	DRAWING NO.							
TITLE SHEET	TITLE I							
TERRAIN UNIT PROPERTIES AND ENGINEERING INTERPRETATIONS	CHART I THRU 3							
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TERRAIN UNIT SYMBOL	TERRAIN UNIT NAME	TOPOGRAPHY AND AREAL DISTRIBUTION	SOIL STRATIGRAPHY	SLOPE CLASSIF ICATION	PROBABLE UNIFIED SOIL TYPES	DRAINAGE AND PERMEABILITY	EROSION POTENTIAL	GROUND- WATER TABLE	PROBABLE PERMAFROST DISTRI- BUTION	FROST HEAVE POTENTIAL	THAW SETTLE- MENT POTENTIAL	BEARING STRENGTH	SLOPE STABILITY	SUITABILITY AS SOURCE OF BORROW
Вх	Bedrock	High elevation mountain areas and steep slopes along rivers.	Angular blocks of rock with some sand and silt overlying bedrock	Steep to near Vertical	Bedrock	Poor to Good Low to High	Low	Deep	Unfrozen to Discontinuous	Low to High	Low	High to Very High	Moderate to High	Good to Excellent
С	Colluvium	Gravity transported material on gentle to steep slopes	Various mixtures of sand, silt & gravel with scattered cobbles and some organics.	Gentle to Steep	GM, SM, ML, GW, SW	Moderate to Good Low to High	Low to High	Shallow to Deep	Sporadic to Generally Frozen	Low to High	Low to High	Low to High	Moderate to High	Poor
Cf	Colluvial Fan Deposits	Steep cone shaped deposits formed where intermittent steep streams containing debris flow onto flatter surfaces	Highly variable layers of silts, sands, gravels and organics with boulders	Moderate to Steep	GM, SM, ML, OL	Moderate to Good Low to High	Moderate to High	Shallow	Sporadic	Low to High	Low to High	Moderate to High	Moderate	Poor to Fair
CI	Landslide	Hummocky unconsolidated deposits of failed soils and bedrock.	Rock rubble, large rock masses, and soils (silty gravels, and sandy silts with possible crude contorted layers).  Larger failures occur in shales and mudstones.	Moderate to Steep	GW, SW, SM, GM, ML	Poor to Good Low to High	Moderate to High	Shallow	Sporadic	Moderate to High	Moderate	Moderate	Moderate (Low where oversteepe ned)	Poor
Cs	Solifluction Deposits	Smooth, moderate to steep slopes on till plains.	Unsorted gravelly sandy silt and gravelly silty sand with faint contorted layering.	Moderate to Steep	GM, SM, ML	Poor Poor	Moderate to High	Shallow (Perched)	Discontinuous to Generally Frozen	High	High	High when frozen, Low when thawed	Low	Poor
Ct	Talus	Gravity transported deposits most frequently found at the base of steep bedrock slopes as coalescing cones and fans.	Angular frost cracked blocks of rock with some silt and sand.	Moderate to Steep	GW, SW	Good High	Low	Deep	Generally Absent to Sporadic	Low	Low	Moderate to High	Moderate (Low where oversteepe ned)	Fair to Good
EI	Loess	Generally flat to very gentle surfaces with channels, circular pits, and terrace scarps; wide spread in the Palmer area.	Silt with some sand and slightly layered	Gentle	ML	Good Moderate	High	Deep	Generally Absent	High	Moderate	Moderate	High (Low where oversteepe ned)	Poor
Es	Eolian Sand	Low ridges or dunes and on generally flat, terraced, and/or pitted surfaces: common in the Palmer area.	Sand w/some silt	Gentle	SP, SM	Good High	Moderate	Deep	Generally Absent	High	Low	Moderate	High (Low where oversteepe ned	Fair to Good

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NATURAL GAS PIPELINE

### TERRAIN UNIT PROPERTIES AND ENGINEERING INTERPRETATIONS

GLENNALLEN TO PALMER SPUR LINE

SCALE IN FEET	DRAWING NO.	REV.
	CHART I OF 3	-

TERRAIN UNIT SYMBOL	TERRAIN UNIT NAME	TOPOGRAPHY AND AREAL DISTRIBUTION	SOIL STRATIGRAPHY	SLOPE CLASSIF ICATION	PROBABLE UNIFIED SOIL TYPES	DRAINAGE AND PERMEABILITY	EROSION POTENTIAL	GROUND- WATER TABLE	PROBABLE PERMAFROST DISTRI- BUTION	FROST HEAVE POTENTIAL	THAW SETTLE- MENT POTENTIAL	BEARING STRENGTH	SLOPE STABILITY	SUITABILITY AS SOURCE OF BORROW
Ffg	Alluvial Fan (Granular) Deposits	Low cone shaped deposits formed where high gradient streams flow onto flatter surfaces.	Subrounded cobbles and gravel with sand and some silt; some sorting and layering.	Moderate	GW, GP, SW, SP, SM	Good High	Moderate	Shallow	Generally Absent to Sporadic	Low to Moderate	Low	Moderate to High	High	Good
Ffs	Alluvial Fan (Fine- grained) Deposits	Low cone shaped deposits formed where low gradient streams flow onto flatter surfaces	Fine sands and silts, common in the Copper River Basin.	Gentle	SM. ML	Poor Low	High	Shallow	Discontinuous to Generally Frozen	High	High	Low to Moderate	Low	Poor
Fp	Floodplain (Granular)	Flat to gently sloping surfaces adjacent to, between and under water filled channels.	Rounded cobbles, gravel, and sand, sorted and layered. With or without silt cover.	Flat to Gentle	GW, GP, SW, SP, SM	Good High	High	Very Shallow	Generally Absent	Generally Low (High for surface cover).	Low	Generally High (Low for surface cover).	High	Good to Excellent
Fpf	Floodplain (Fine- grained)	Flat to gently sloping surfaces adjacent to, between and under water filled streams. Typically in Copper River Basin	Fine-grained material with scattered sand and gravel.	Flat to Gentle	ML	Poor Low	High	Very Shallow	Discontinuous to Generally Frozen	High	High	Low to Moderate	Low	Poor
Fpt	Terrace	Flat surfaced, remnants of former floodplain deposits isolated above the present floodplain.	Round cobbles, gravel, and sand, sorted and layered. Generally with a thin silt cover.	Flat to Gentle	GW, GP, SW, SP, SM, ML	Good High	Low to High	Shallow to Deep	Generally Absent	Generally Low (High for surface cover).	Low	Generally High (Low for surface cover).	High (Low where oversteepe ned)	Good to Excellent
GL	Glacial Lacustrine (glacial lake) Deposits	Fine-grained material laid down in glacial lakes	Fine-grained material with scattered sand and gravel.	Flat	ML, CL	Poor Very Low	High	Very Shallow	Discontinuous to Generally Frozen	High	High	Low to Moderate	Low	Poor
Gt	Glacial Till	Undulating floor of glaciated U-shaped Matanuska Valley and adjacent slopes and in the rolling Eureka Summit area.	Gravelly silty sand and gravelly sandy silt with cobbles; subrounded to subangular striated cobbles; faint layering; unsorted.	Gentle to steep	GM, SM, ML, GW, SW	Moderate Moderate	Moderate to High	Moderate to Deep (shallow where frozen)	Sporadic to Generally Frozen	High	High (where frozen)	Moderate to High	Low to Moderate	Poor to Fair
GF	Glacio Fluvial (meltwater) Deposits, Undifferenti ated	Deposits laid down by streams flowing on, under, or from glaciers.	Rounded and striated cobbles, gravel, and sand with minor silt.	Gentle to steep	GW, GP, SW, SP	Good High	Low	Shallow to Deep	Generally Absent	Low	Low	High	High	Excellent
GFo	Outwash Deposits	Generally flat to very gentle surfaces possibly with channels, circular pits, and scarps; widespread in the Palmer area.	Rounded and striated cobbles, gravel, and sand, sorted and layered.	Gentle	GW, SW	Good High	Low	Shallow to Deep	Generally Absent	Low	Low	High	High	Excellent

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NATURAL GAS PIPELINE

### TERRAIN UNIT PROPERTIES AND ENGINEERING INTERPRETATIONS

GLENNALLEN TO PALMER SPUR LINE

SCALE IN FEET	DRAWING NO.	REV.
	CHART 2 OF 3	ı

TERRAIN UNIT SYMBOL	TERRAIN UNIT NAME	TOPOGRAPHY AND AREAL DISTRIBUTION	SOIL STRATIGRAPHY	SLOPE CLASSIF ICATION	PROBABLE UNIFIED SOIL TYPES	DRAINAGE AND PERMEABILITY	EROSION POTENTIAL	GROUND- WATER TABLE	PROBABLE PERMAFROST DISTRI- BUTION	FROST HEAVE POTENTIAL	THAW SETTLE- MENT POTENTIAL	BEARING STRENGTH	SLOPE STABILITY	SUITABILITY AS SOURCE OF BORROW
GFe	Esker Deposits	Rounded to sharp crested sinuous ridges and concentric crescents; well developed in the Palmer area.	Rounded and striated cobbles, gravel, and sand with minor silt. Crudely to well sorted and layered.	Steep local slopes	GW, SW	Good High	Low	Deep	Generally Absent	Low	Low	High	Moderate	Excellent
GFk	Kame Deposits	Rounded to sharp- crested hummocky hills and hummocky terrace surfaces; well developed in the Palmer area.	Rounded and striated cobbles, gravel, and sand with minor silt. Crudely sorted, distorted layers.	Steep local slopes	GW, SW	Good High	Low	Deep	Generally Absent	Low	Low	High	Moderate	Excellent
GFI	Lowland Glacio Fluvial (meltwater) Deposits	Generally flat to very gentle surfaces possibly with channels	Silt, sandy silt, and fine sand with some organic material.	Flat to Gentle	ML	Poor Very low	High	Shallow	Generally Frozen	High	High	Low when thawed; High when frozen	Low	Poor
Ht	Mine Tailings	Flat to hummocky, terraced deposits, in the Eska Creek area.	Unsorted, poorly layered gravelly sand and sandy gravel with some silt.	Gentle to steep	GW, SW, GM, SM	High High	Moderate	Deep	Generally Absent	Low	Low	Low to Moderate	Low to Moderate	Fair to Good
L	Lacustrine Deposits	Flat to gently sloping lake deposits.	Sandy silt and silty sand with some clay and occasional pebbles, sorted and layered.	Flat to Gentle	SM, ML	Poor Poor	High	Shallow (perched)	Generally Frozen	High	High	Low when thawed; High when frozen	Low	Poor
Lt	Lacustrine Thaw Basin/Lake Deposits	Generally fine-grained, organic rich deposits in lakes and depressions formed by thawing of ground ice.	Well stratified silt and organic deposits in thin layers.	Flat	ML, CL, OL	Poor Low	Low	Very Shallow	Discontinuous to Generally Frozen	High	High	Low	Low	Nil
Me	Marine Estuarine Deposits	Marsh and mudflat areas, crossed by low gradient channels, south of Palmer.	Silt, sandy silt, and fine sand with some organic material.	Flat	SM, ML	Very poor Poor	High	Very Shallow	Generally Absent	High	High	Low	Low	Nil
0	Organic Deposits	In swales between small rises on all surfaces. Generally flat and very poorly drained.	Decomposed and undecomposed organic material with some silt.	Flat to Gentle	PT, OL	Poor Moderate to High	Low	Very Shallow (at surface)	Sporadic to Discontinuous	High	High	Very Low	Low	Nil
Vm	Mud Volcano	Low cones formed at mineral springs by the slow accretion of mud near Tolsona Creek.	Thinly layered fine- grained deposits.	Gentle	ML, CL	Very Poor Poor	High	Very Shallow	Discontinuous	High	High	Low	Low	Nil
WI	Water Body (Lakes)	Project - Wide	N/A	Flat	N/A	N/A	N/A	Surface	Generally Absent	N/A	N/A	N/A	N/A	N/A

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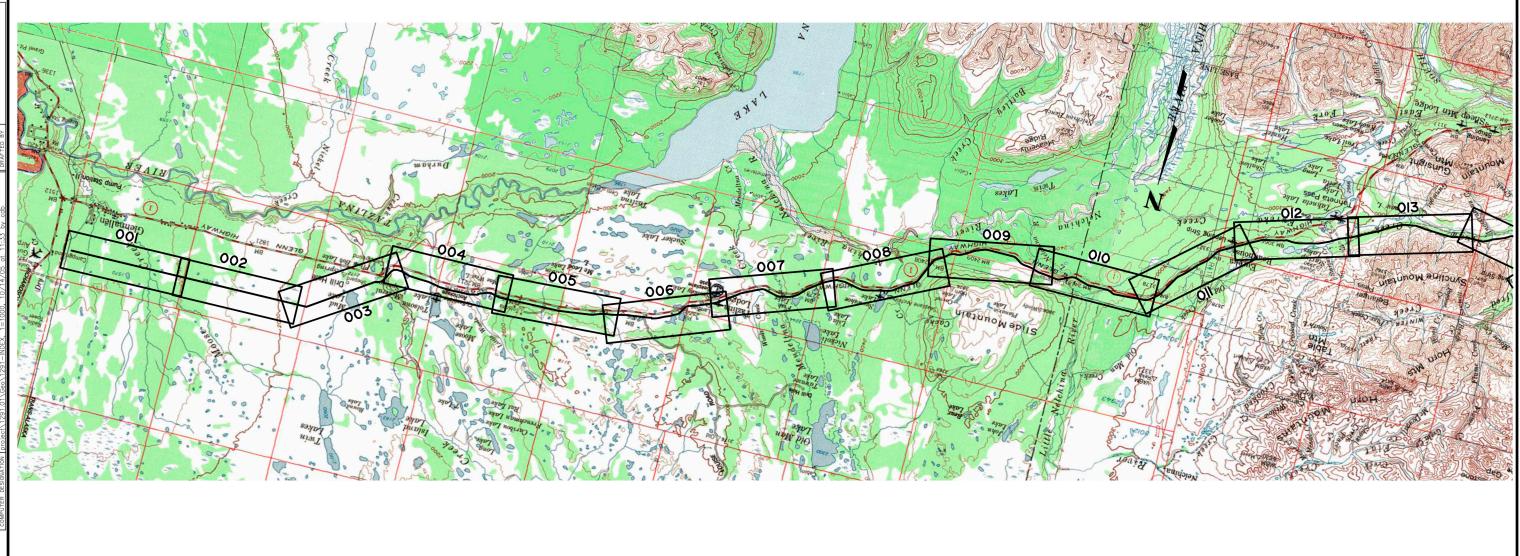
NATURAL GAS PIPELINE

### TERRAIN UNIT PROPERTIES AND ENGINEERING INTERPRETATIONS

GLENNALLEN TO PALMER SPUR LINE

SCALE IN FEET	DRAWING NO.	REV.
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### **ROUTE INDEX DRAWING**



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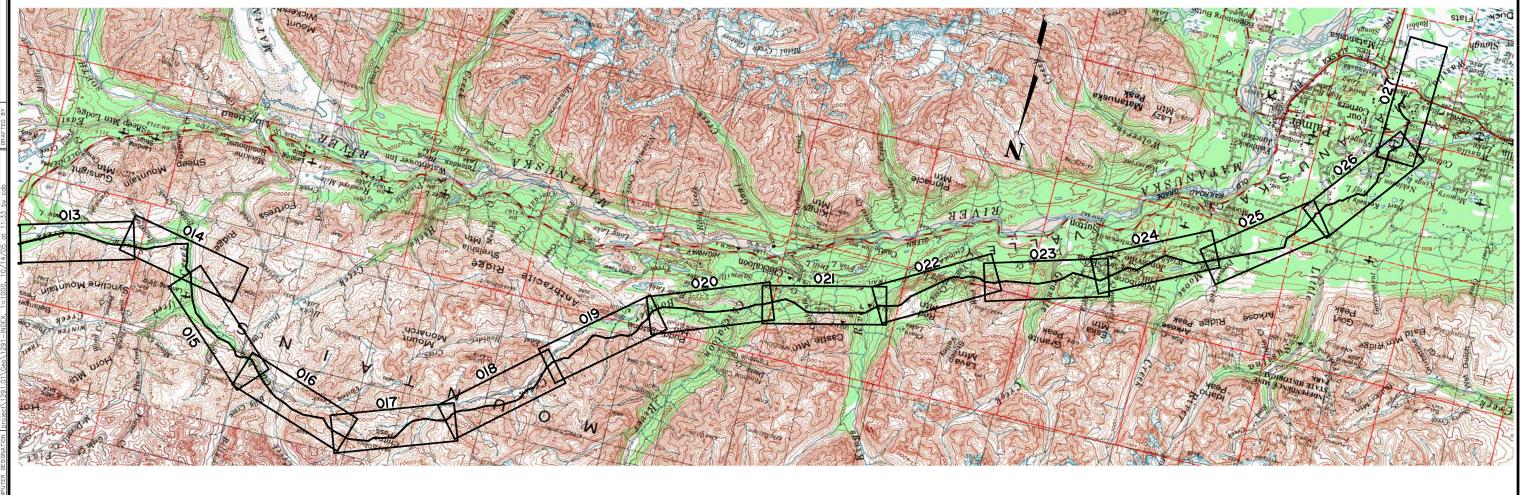
#### ROUTE INDEX DRAWING

GLENNALLEN TO PALMER SPUR LINE

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Note: The alignment as shown is based on the March, 2005 alignment.

### **ROUTE INDEX DRAWING**



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#### ROUTE INDEX DRAWING

GLENNALLEN TO PALMER SPUR LINE

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INDEX 2 OF 2	INDEX 2 OF 2	

Note: The alignment as shown is based on the March, 2005 alignment.

SPECIFICATIONS
STANDARDS

-BD02, 1291-USGS-IMAGE, SID

REF: 1291-AIRPHOTOS, 1

